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DECISION
of 6 March 1996

Case Number: T 0330/94 - 3.2.2

Application Number: 89304881.9

Publication Number: 0342894

IPC: C23C 14/34

Language of the proceedings: EN

Title of invention:
Sputtering target

Applicant:
KABUSHIKI KAISHA TOSHIBA

Opponent:
-

Headword:
Sputtering target/TOSHIBA

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step -yes"

Decisions cited:
-

Catchword:
-



Case Number: T 0330/94 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 6 March 1996

Appellant:

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Representative:

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Decision under appeal:

Decision of the Examining Division of the European
Patent Office posted 16 November 1993 refusing
European patent application No. 89 304 881.9
pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: H. Seidenschwarz
Members: R. Lunzer
J. De Preter

Summary of Facts and Submissions

- I. European patent application No. 89 304 881.9, Publication No. 342 894, filed on 15 May 1989, claiming a priority date of 16 May 1988 derived from Japanese Application No. 118429/88, was refused by a decision of the Examining Division dated 16 November 1993. That decision was based on a set of claims filed on 17 May 1993, of which Claim 1 was as follows:

"A sputtering target divided into respective target elements of two or more types arranged as a composite on a substrate, and a thin sheet interposed between said substrate and said target elements, at least one of the target elements being a metal and the thin sheet comprising the same metal."

- II. The ground for the refusal was that the Claim lacked clarity due to the undefined use of the word "thin". In addition it was held that there was a lack of any inventive step in the light of an English language abstract of:

(1) JP-A-59 179 783

which disclosed a sputtering target differing from Claim 1 then in suit only in that the metal common to one of the target elements and the thin sheet was silicon, rather than molybdenum, and that the stated purpose of the sheet was to equalise the effects of differing electrical impedances. It was regarded as obvious to select the other metal for the sheet, as an alternative to the silicon selected in document (1). Additionally it was held that, leaving aside document (1), it was "intuitively obvious" to the skilled person, knowing that sputtering occurs from all

surfaces of a target electrode at a cathode potential exposed to a glow discharge, that unwanted sputtering and consequent contamination would result if gaps existed between the segments of a mosaic type target, and that undesired contamination would occur unless the floor of the spaces between the segments were to be covered by one of the metals to be deposited.

III. An appeal against that decision was filed on 6 January 1994, the appeal fee was paid on the following day, and the statement of grounds of appeal was filed on 25 March 1994. In that Statement, and during oral proceedings held on 6 March 1996, the Appellant contended essentially that the decision under appeal failed to take account of the fact that the problem confronted by document (1) was wholly different from that of the patent in suit. When properly understood, document (1) would not have suggested to the skilled worker that the silicon sheet there proposed could usefully be replaced by a molybdenum sheet. Such a step would defeat entirely the purpose of interposing the silicon sheet, which was to increase the impedance between the target elements and the copper backing plate, so that the rate of deposition from the molybdenum and silicon segments would remain constant, and not be subject to variation as the silicon segments were consumed.

IV. Together with its statement of grounds of appeal, the Appellant filed a main request and two subsidiary requests, each comprising a set of five claims, but during the oral proceedings the first auxiliary request became its sole request. Claim 1 in accordance with that request was in the following form:

"A sputtering target (1) divided into respective target elements (2, 3) comprising two or more materials arranged as a composite on a substrate (6) and a thin

sheet of thickness 0.05mm to 0.6mm interposed between said substrate (6) and said target elements (2, 3), the thin sheet (7) comprising high purity Mo, at least one target element comprising Mo and other target elements comprising Si or Ta."

- V. The Appellant requested that the decision under appeal be set aside, and a patent granted on the basis of Claim 1 in accordance with the sole request.

Reasons for the Decision

1. The appeal is admissible.
2. *Admissibility of amendments*
 - 2.1 The proposed amendments involve some degree of clarification of the language used in the Claims as originally filed, together with the introduction of features which were disclosed in the application as filed.
 - 2.2 In particular, the limitation of Claim 1 to a thin sheet of Mo and the target elements to those consisting of either Si and Mo, or Ta and Mo, was disclosed in the Table of experiments included in the application as filed, while the thickness of the Mo sheet being 0.05mm to 0.6 mm, and preferably 0.1mm to 0.5mm was disclosed at page 3 line 5 of the application as published. As these amendments do not add subject-matter to the application as originally filed, the requirements of Article 123(2) EPC are satisfied, and the amended Claim is admissible.

3. *Novelty*

Having reviewed the documents cited in the European search report, including document (1), the Board is satisfied that the subject-matter of Claim 1 is to be considered novel within the meaning of Article 54 EPC.

4. *Inventiveness*

4.1 During the oral proceedings, the Appellant's representative produced a translation of the Japanese patent specification on which document (1) was based. This showed that document (1) was directed to an entirely different problem from that which concerned the application in suit. As silicon is a semi-conductor, its conductivity is significantly lower than that of the metal parts of a composite target. Consequently, as the silicon target elements are consumed, their thickness and their impedance change, with the result that the rate of deposition of silicon changes. This leads to non-uniformity in the composition of the deposited layer with the passage of time. That problem is overcome in accordance with the Japanese patent by interposing a sheet of silicon between the conductive copper backing plate and the target elements made of silicon and a high melting point metal, so that both the metal elements and the silicon elements of the target are influenced by the resistivity of the silicon backing sheet. When so understood, it is clear that the objective to which document (1) is directed, mentioned in its final sentence, is to obtain a stable composition ratio, and of doing so by exploiting the poor conductivity of the silicon backing sheet. Consequently, replacing that backing sheet by a conductive metal sheet would defeat its objective, of securing a stable composition being

deposited, since a conductive molybdenum sheet would have an electrical effect comparable to that of the copper backing plate, and the problem which document (1) sought to overcome would be reintroduced.

4.2 In contrast to the problem solved by document (1), which concerned obtaining a constant ratio in the composition being deposited, the application in suit is concerned with overcoming the altogether different problem of contamination of the deposited layer by a third element exposed to bombardment as a result of the existence of small gaps between the pieces of metal or semi-conductor making up the target. Document (1), and still more so the full patent specification on which the abstract is based, shows that there is a positive advantage to be gained from inserting a semi-conducting silicon sheet between the target elements and the conductive copper backing plate, which advantage would be lost by the substitution of a molybdenum sheet. Accordingly, insofar as Claim 1 of the application in suit is directed to a target composed of molybdenum and silicon, the Board is satisfied that the replacement of the silicon sheet of document (1) with a molybdenum sheet as now claimed would have been contrary to the teaching of that document, resulting in the loss of the advantages which were to be derived from the use of the silicon sheet, and that such a fundamental departure would not have been obvious to the skilled worker.

4.3 Claim 1 of the application in suit also covers the combination of a target made up of molybdenum and tantalum, with a molybdenum backing sheet. As both molybdenum and tantalum are conductive metals, the problems arising out of the use of the semi-conducting silicon target elements would not arise, and document (1) would be irrelevant. The question then arises as to whether it would have been obvious to have

used a molybdenum sheet of the specified thickness with a view to overcoming the problem of possible contamination caused by gaps between the target elements. In that connection the Board observes that the proposed solution, although simple, is but one among a number of possible solutions. The same effect could be achieved with a tantalum sheet, or even more simply by so shaping the target elements as to prevent penetration between gaps. As the only cited prior art, document (1), is directed to a wholly different problem, the Board is not satisfied that common general knowledge on its own would have led the skilled worker to the claimed solution.

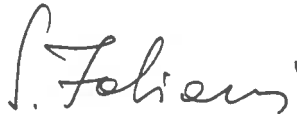
- 4.3 For the above reasons, the Board is satisfied that the subject-matter of Claim 1 does involve an inventive step, and that the requirements of Article 56 EPC are therefor satisfied.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the Examining Division with the order that a patent be granted on the following basis
 - Claims 1 to 5 filed during the oral proceedings
 - the description to be adapted
 - the Figures as originally filed.

The Registrar:



S. Fabiani

The Chairman:



H. Seidenschwarz

